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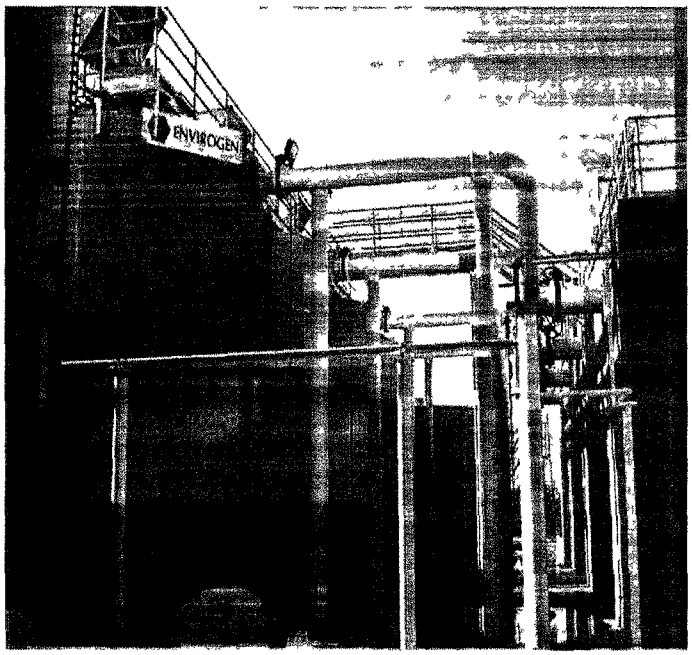
USFilter

ENVIROGEN

AMMONIUM PERCHLORATE TREATMENT



FBR System at Aerojet in California

The team of Envirogen and USF-Envirex has extensive experience with the treatment of ammonium perchlorate, as exemplified by the 4,000 gpm system shown above at Aerojet's facility near Sacramento, California. This system, utilizing four fluidized bed reactors (FBRs), has been producing water with non-detect perchlorate in the effluent since mid-1999. Two additional FBR systems are now operating, one at the Longhorn Army Ammunition Plant and the other at a confidential site, both producing water with non-detect perchlorate in the effluent.

The Problem

Regulatory pressures to reduce perchlorate concentrations in groundwater and drinking water have recently intensified. The EPA's recently released draft reference dose results in a protective concentration of 1 µg/L for drinking water. An increasing number of states have established action levels, including California, Texas, Nevada and Arizona. California has recently lowered their action level to 4 µg/L.

The Solution

The search for economical technologies to meet these standards has included research funded by the EPA and AWWARF, which concluded that biochemical treatment appears to be the most economically feasible technology for dealing with perchlorate-contaminated waters at all con-centrations.

Envirogen and Envirex have formed a Team to provide biological solutions to a broad spectrum of perchlorate problems. The Team's lead reactor configuration for this effort is the FBR.

The FBR is a fixed-film bioreactor that fosters the growth of microorganisms on a hydraulically fluidized media (usually sand or granular activated carbon). The fluidized media provides an extremely large surface area upon which microorganisms can grow, producing a large biomass inventory. This large biomass inventory provides the system's high volumetric efficiency.

The influent is fed into the lower portion of the FBR where it is mixed with nutrients, a cometabolite, and pH control chemicals. The contaminated water stream flows upward through the reactor at a velocity sufficient to fluidize (expand) the bed, allowing the biomass to come into intimate contact with the contaminants. The long solids retention time characteristic of the system allows for the removal of perchlorate while minimizing process upsets. This process literally breaks the perchlorate down into its innocuous elements.

The anoxic process for destroying perchlorate is essentially the same process used to remove nitrate. In fact, nitrate is commonly present in perchlorate-contaminated streams and will be removed with perchlorate in a single FBR.

Our team has vast experience with nitrate removal. Two large 35-MGD facilities are in operation, one at Reno/Sparks, NV with 10 years of continuous operation and one in Stockholm. Both have consistently reduced nitrate to detection levels, a necessity, if one is going to biologically remove perchlorate.

Benefits

- *Performance meets EPA and CA guidelines*
- *Cost effective -- low capital and O&M costs*
- *Minimal biosludge production*
- *Small footprint*
- *Minimal operator attention required*

Case Histories

In 1998, GenCorp Aerojet Corporation (Aerojet) installed four FBRs (Figure 1) to remediate 400 gpm of groundwater contaminated with ammonium perchlorate at a site in Rancho Cordova, CA. The groundwater contains perchlorate at a concentration of approximately 6 mg/L. The system has consistently produced non-detect perchlorate (≤ 4 µg/L) since completion of start-up.

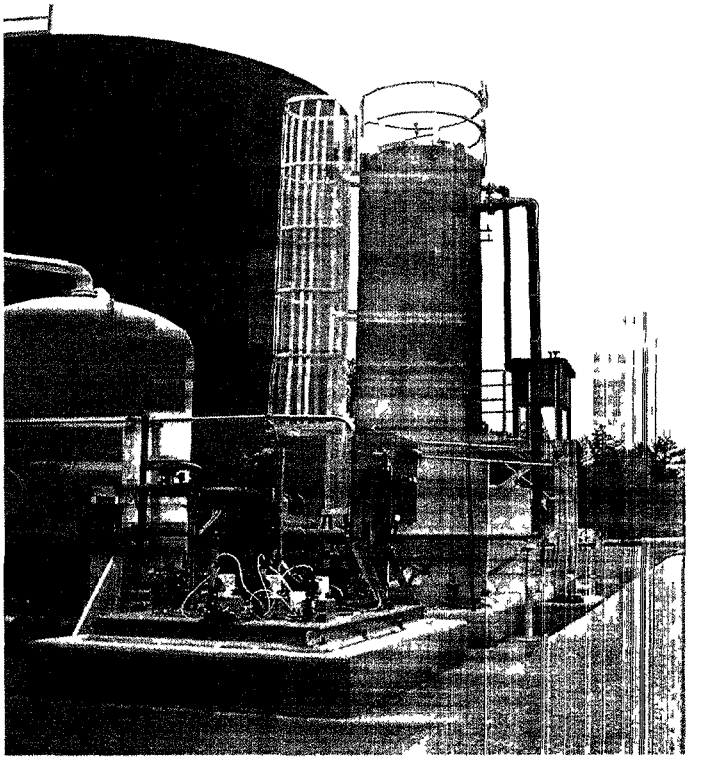
The Longhorn Army Ammunition Plant has installed a single FBR which treats up to 35 mg/L perchlorate producing non-detect levels of perchlorate.

Another confidential client has installed a single FBR which started up in about 6 days It treats 4 mg/L perchlorate producing non-detect levels.

Our Perchlorate Experience Includes:

- *The largest full-scale perchlorate treatment facility operating in the country today.*
- *Pilot plant evaluation with anoxic FBR, RO and ion exchange technologies.*
- *Pilot plant evaluation of alternative reactor media and carbon sources.*

The Envirogen/USF-Envirex Team currently has 45 full-scale FBRs in the field.



FBR System at Longhorn Army Ammunition Plant

Fully instrumented **field pilot systems** are available for technology demonstration and optimization at your site.

FOR MORE INFORMATION CONTACT:

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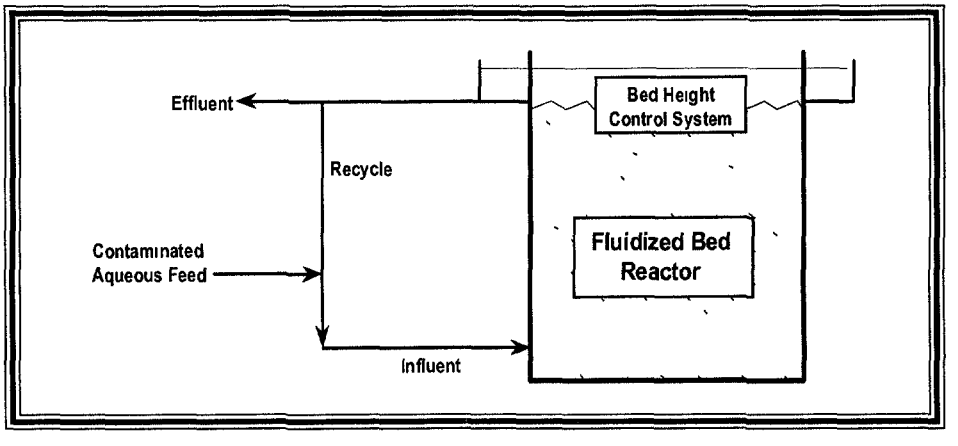

Figure 1. Simplified schematic of FBR configuration.